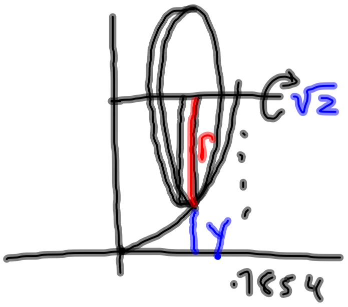
21. $y=\sqrt{2}$ $\quad y=\sec x \tan x$ $\quad$ y axis $\quad$ about $y=\sqrt{2}$



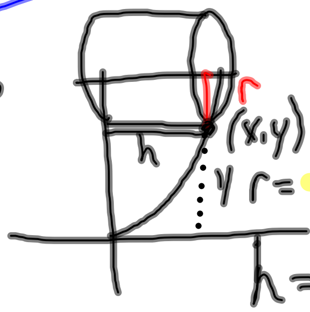
$r=\sqrt{2}-\sec x \tan x$

$$\int_0^{.7854} \pi\left(\sqrt{2}-\sec(x)\tan(x)\right)^2 dx$$

$y+r=\sqrt{2}$

$r=\sqrt{2}-y$

shells?



$\int 2\pi r h\, dy$

$r=\sqrt{2}-y$

$h=x$, can't get in terms of y

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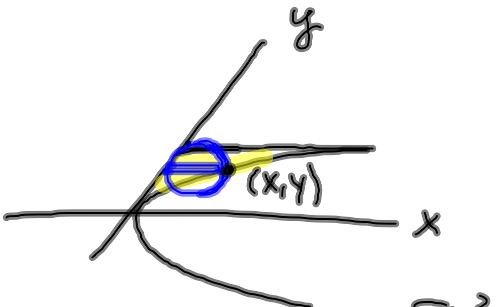
41. $x=\sqrt{5}y^2$ $\quad y=0,\ y=2$, y axis



$$\int_0^2 \pi r^2\, dy$$

need r in terms of y

$2r=x=\sqrt{5}y^2$

$x=\frac{\sqrt{5}y^2}{2}$

$$\int_0^2 \pi\left(\frac{\sqrt{5}y^2}{2}\right)^2 dy=8\pi$$

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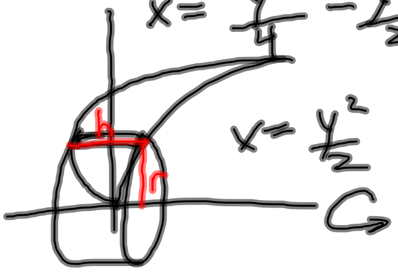
$x = \frac{y^4}{4} - \frac{y^2}{2}$



$$\int_c^d 2\pi r h \, dy$$

$$\int_0^2 2\pi y \left(\frac{y^2}{2} - \frac{y^4}{4} + \frac{y^2}{2} \right)$$

$r = y$

$h = \frac{y^2}{2} - \left(\frac{y^4}{4} - \frac{y^2}{2} \right)$

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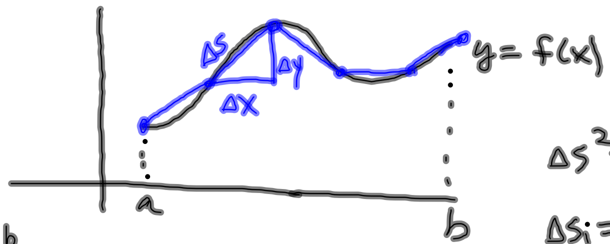
7.4

arc lengths

find the length of the curve



$$\Delta s^2 = \Delta x^2 + \Delta y^2$$

$$\Delta s_i = \sqrt{\Delta x^2 + \Delta y_i^2}$$

$$\int_a^b f(x)\,dx = \lim_{\Delta x \to 0} \sum f(x_i)\Delta x$$

$$\lim_{\Delta x \to 0} \sum \sqrt{\Delta x^2 + \Delta y_i^2}$$

$$\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x} = \frac{dy}{dx}$$

Δx

$$\lim_{\Delta x \to 0} \sum \sqrt{1 + \frac{\Delta y_i^2}{\Delta x^2}} \sqrt{\Delta x^2}$$

arc length

$$\boxed{s = \int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2} \, dx}$$

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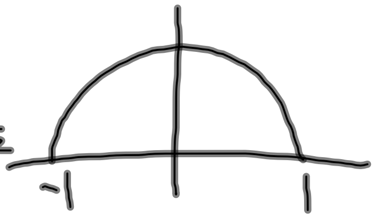
$y = \sqrt{1-x^2}$



$\frac{dy}{dx} = (-2x)\frac{1}{2}(1-x^2)^{-\frac{1}{2}}$

$\frac{dy}{dx} = \frac{-x}{\sqrt{1-x^2}}$

$$\int_{-1}^{1} \sqrt{1 + \left(\frac{-x}{\sqrt{1-x^2}}\right)^2}\, dx$$

$$\pi = \int_{-1}^{1} \sqrt{1 + \frac{x^2}{1-x^2}}\, dx$$

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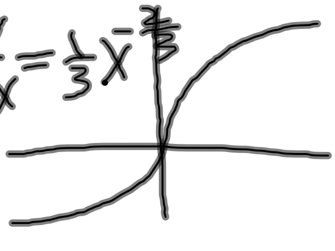
$y = x^{\frac{1}{3}}$ $(-8,-2)$ $(8,2)$

$\frac{dy}{dx} = \frac{1}{3}x^{-\frac{2}{3}}$



got $x = g(y)$

$x = y^3$

$\frac{dx}{dy} = 3y^2$

undef at $x=0$

use if $x=g(y)$

$$\boxed{\int_c^d \sqrt{1+\left(\frac{dx}{dy}\right)^2}\, dy}$$

EX 3

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